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Jameco Part Number 239038

# MC74AC157, MC74ACT157

## Quad 2-Input Multiplexer

The MC74AC157/74ACT157 is a high–speed quad 2–input multiplexer. Four bits of data from two sources can be selected using the common Select and Enable inputs. The four outputs present the selected data in the true (noninverted) form.

The MC74AC157/74ACT157 can also be used as a function generator.

- Outputs Source/Sink 24 mA
- ′ACT157 Has TTL Compatible Inputs

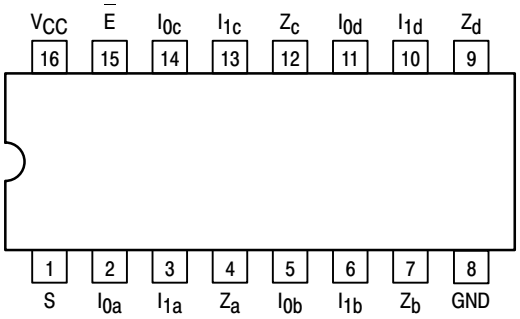


**Figure 1. Pinout: 16–Lead Packages Conductors**
(Top View)

**PIN NAME**

| PIN | FUNCTION |
|---|---|
| $I_{0a}$–$I_{0d}$ | Source 0 Data Inputs |
| $I_{1a}$–$I_{1d}$ | Source 1 Data Inputs |
| E | Enable Input |
| S | Select Input |
| $Z_a$–$Z_d$ | Outputs |

**TRUTH TABLE**

| Inputs | | | | Outputs |
|---|---|---|---|---|
| $\overline{E}$ | S | $I_0$ | $I_1$ | Z |
| H | X | X | X | L |
| L | H | X | L | L |
| L | H | X | H | H |
| L | L | L | X | L |
| L | L | H | X | H |

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial

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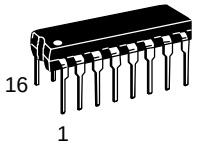
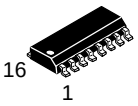
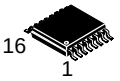


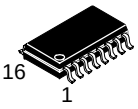

**DIP–16**
**N SUFFIX**
**CASE 648**




**SO–16**
**D SUFFIX**
**CASE 751B**




**TSSOP–16**
**DT SUFFIX**
**CASE 948F**




**EIAJ–16**
**M SUFFIX**
**CASE 966**

**ORDERING INFORMATION**

| Device | Package | Shipping |
|---|---|---|
| MC74AC157N | PDIP–16 | 25 Units/Rail |
| MC74ACT157N | PDIP–16 | 25 Units/Rail |
| MC74AC157D | SOIC–16 | 48 Units/Rail |
| MC74ACT157D | SOIC–16 | 48 Units/Rail |
| MC74AC157DR2 | SOIC–16 | 2500 Tape & Reel |
| MC74ACT157DR2 | SOIC–16 | 2500 Tape & Reel |
| MC74AC157DT | TSSOP–16 | 96 Units/Rail |
| MC74ACT157DT | TSSOP–16 | 96 Units/Rail |
| MC74AC157DTR2 | TSSOP–16 | 2500 Tape & Reel |
| MC74ACT157DTR2 | TSSOP–16 | 2500 Tape & Reel |
| MC74AC157M | EIAJ–16 | 50 Units/Rail |
| MC74ACT157M | EIAJ–16 | 50 Units/Rail |
| MC74AC157MEL | EIAJ–16 | 2000 Tape & Reel |
| MC74ACT157MEL | EIAJ–16 | 2000 Tape & Reel |

**DEVICE MARKING INFORMATION**

See general marking information in the device marking section on page 6 of this data sheet.

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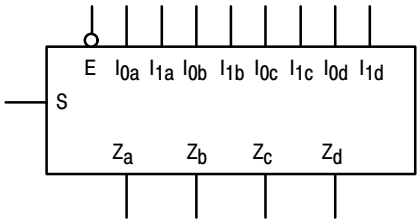


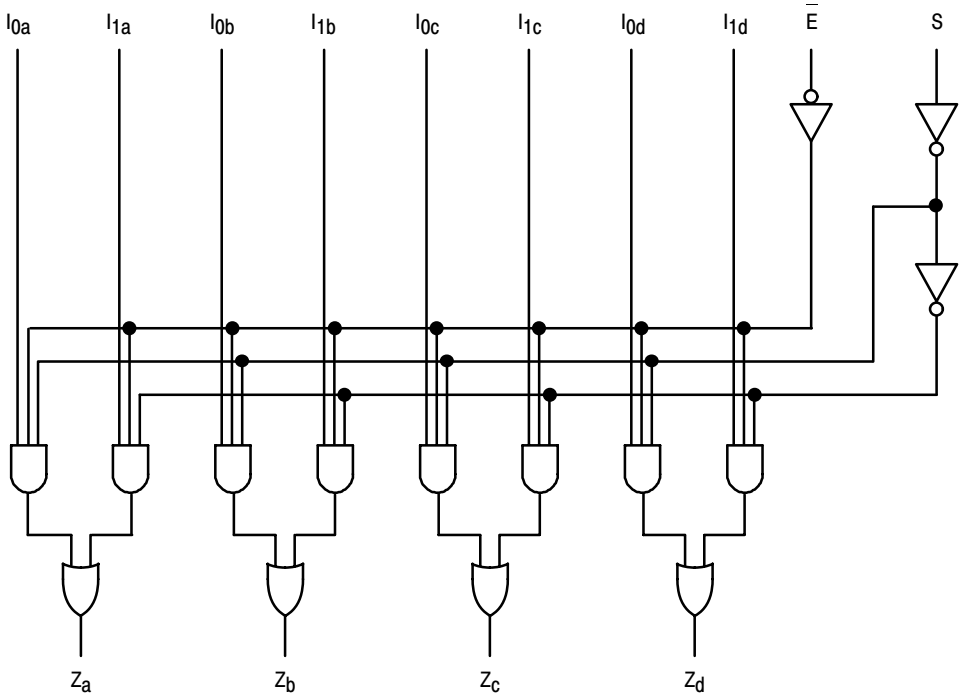

**Figure 2. Logic Symbol**

## FUNCTIONAL DESCRIPTION

The MC74AC157/74ACT157 is a quad 2–input multiplexer. It selects four bits of data from two sources under the control of a common Select input (S). The Enable input (E) is active–LOW. When E is HIGH, all of the outputs (Z) are forced LOW regardless of all other inputs. The MC74AC157/74ACT157 is the logic implementation of a 4–pole, 2–position switch where the position of the switch is determined by the logic levels supplied to the Select input. The logic equations for the outputs are shown below:

$Z_a = \overline{E} \bullet (I_{1a} \bullet S + I_{0a} \bullet \overline{S})$
$Z_b = \overline{E} \bullet (I_{1b} \bullet S + I_{0b} \bullet \overline{S})$
$Z_c = \overline{E} \bullet (I_{1c} \bullet S + I_{0c} \bullet \overline{S})$
$Z_d = \overline{E} \bullet (I_{1d} \bullet S + I_{0d} \bullet S)$

A common use of the MC74AC157/74ACT157 is the moving of data from two groups of registers to four common output busses. The particular register from which the data comes is determined by the state of the Select input. A less obvious use is as a function generator. The MC74AC157/74ACT157 can generate any four of the sixteen different functions of two variables with one variable common. This is useful for implementing gating functions.




NOTE: This diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

**Figure 3. Logic Diagram**

**MAXIMUM RATINGS***

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{CC}$ | DC Supply Voltage (Referenced to GND) | –0.5 to +7.0 | V |
| $V_{IN}$ | DC Input Voltage (Referenced to GND) | –0.5 to $V_{CC}$ +0.5 | V |
| $V_{OUT}$ | DC Output Voltage (Referenced to GND) | –0.5 to $V_{CC}$ +0.5 | V |
| $I_{IN}$ | DC Input Current, per Pin | ±20 | mA |
| $I_{OUT}$ | DC Output Sink/Source Current, per Pin | ±50 | mA |
| $I_{CC}$ | DC $V_{CC}$ or GND Current per Output Pin | ±50 | mA |
| $T_{stg}$ | Storage Temperature | –65 to +150 | °C |

*Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the Recommended Operating Conditions.

**RECOMMENDED OPERATING CONDITIONS**

| Symbol | Parameter | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{CC}$ | Supply Voltage | ′AC | 2.0 | 5.0 | 6.0 | V |
| | | ′ACT | 4.5 | 5.0 | 5.5 | |
| $V_{IN}$, $V_{OUT}$ | DC Input Voltage, Output Voltage (Ref. to GND) | | 0 | – | $V_{CC}$ | V |
| $t_r$, $t_f$ | Input Rise and Fall Time (Note 1) ′AC Devices except Schmitt Inputs | $V_{CC}$ @ 3.0 V | – | 150 | – | ns/V |
| | | $V_{CC}$ @ 4.5 V | – | 40 | – | |
| | | $V_{CC}$ @ 5.5 V | – | 25 | – | |
| $t_r$, $t_f$ | Input Rise and Fall Time (Note 2) ′ACT Devices except Schmitt Inputs | $V_{CC}$ @ 4.5 V | – | 10 | – | ns/V |
| | | $V_{CC}$ @ 5.5 V | – | 8.0 | – | |
| $T_J$ | Junction Temperature (PDIP) | | – | – | 140 | °C |
| $T_A$ | Operating Ambient Temperature Range | | –40 | 25 | 85 | °C |
| $I_{OH}$ | Output Current – High | | – | – | –24 | mA |
| $I_{OL}$ | Output Current – Low | | – | – | 24 | mA |

1. $V_{IN}$ from 30% to 70% $V_{CC}$; see individual Data Sheets for devices that differ from the typical input rise and fall times.
2. $V_{IN}$ from 0.8 V to 2.0 V; see individual Data Sheets for devices that differ from the typical input rise and fall times.

**DC CHARACTERISTICS**

| Symbol | Parameter | $V_{CC}$ (V) | 74AC | | 74AC | Unit | Conditions |
|---|---|---|---|---|---|---|---|
| | | | $T_A$ = +25°C | | $T_A$ = –40°C to +85°C | | |
| | | | Typ | Guaranteed Limits | | | |
| $V_{IH}$ | Minimum High Level Input Voltage | 3.0<br>4.5<br>5.5 | 1.5<br>2.25<br>2.75 | 2.1<br>3.15<br>3.85 | 2.1<br>3.15<br>3.85 | V | $V_{OUT}$ = 0.1 V or $V_{CC}$ – 0.1 V |
| $V_{IL}$ | Maximum Low Level Input Voltage | 3.0<br>4.5<br>5.5 | 1.5<br>2.25<br>2.75 | 0.9<br>1.35<br>1.65 | 0.9<br>1.35<br>1.65 | V | $V_{OUT}$ = 0.1 V or $V_{CC}$ – 0.1 V |
| $V_{OH}$ | Minimum High Level Output Voltage | 3.0<br>4.5<br>5.5 | 2.99<br>4.49<br>5.49 | 2.9<br>4.4<br>5.4 | 2.9<br>4.4<br>5.4 | V | $I_{OUT}$ = –50 μA |
| | | 3.0<br>4.5<br>5.5 | –<br>–<br>– | 2.56<br>3.86<br>4.86 | 2.46<br>3.76<br>4.76 | V | *$V_{IN}$ = $V_{IL}$ or $V_{IH}$<br>–12 mA<br>$I_{OH}$ –24 mA<br>–24 mA |
| $V_{OL}$ | Maximum Low Level Output Voltage | 3.0<br>4.5<br>5.5 | 0.002<br>0.001<br>0.001 | 0.1<br>0.1<br>0.1 | 0.1<br>0.1<br>0.1 | V | $I_{OUT}$ = 50 μA |
| | | 3.0<br>4.5<br>5.5 | –<br>–<br>– | 0.36<br>0.36<br>0.36 | 0.44<br>0.44<br>0.44 | V | *$V_{IN}$ = $V_{IL}$ or $V_{IH}$<br>12 mA<br>$I_{OL}$ 24 mA<br>24 mA |
| $I_{IN}$ | Maximum Input Leakage Current | 5.5 | – | ±0.1 | ±1.0 | μA | $V_I$ = $V_{CC}$, GND |
| $I_{OLD}$ | †Minimum Dynamic Output Current | 5.5 | – | – | 75 | mA | $V_{OLD}$ = 1.65 V Max |
| $I_{OHD}$ | | 5.5 | – | – | –75 | mA | $V_{OHD}$ = 3.85 V Min |
| $I_{CC}$ | Maximum Quiescent Supply Current | 5.5 | – | 8.0 | 80 | μA | $V_{IN}$ = $V_{CC}$ or GND |

*All outputs loaded; thresholds on input associated with output under test.
†Maximum test duration 2.0 ms, one output loaded at a time.

NOTE: $I_{IN}$ and $I_{CC}$ @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V $V_{CC}$.

**AC CHARACTERISTICS** (For Figures and Waveforms – See Section 3 of the ON Semiconductor FACT Data Book, DL138/D)

| Symbol | Parameter | $V_{CC}$* (V) | 74AC $T_A$ = +25°C $C_L$ = 50 pF | | | 74AC $T_A$ = –40°C to +85°C $C_L$ = 50 pF | | Unit | Fig. No. |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | | |
| $t_{PLH}$ | Propagation Delay S to $Z_n$ | 3.3<br>5.0 | 1.5<br>1.5 | 7.0<br>5.5 | 11.5<br>9.0 | 1.5<br>1.5 | 13.0<br>10.0 | ns | 3–6 |
| $t_{PHL}$ | Propagation Delay S to $Z_n$ | 3.3<br>5.0 | 1.5<br>1.5 | 6.5<br>5.0 | 11.0<br>8.5 | 1.5<br>1.0 | 12.0<br>9.5 | ns | 3–6 |
| $t_{PLH}$ | Propagation Delay E to $Z_n$ | 3.3<br>5.0 | 1.5<br>1.5 | 7.0<br>5.5 | 11.5<br>9.0 | 1.5<br>1.5 | 13.0<br>10.0 | ns | 3–6 |
| $t_{PHL}$ | Propagation Delay $E_n$ to $Z_n$ | 3.3<br>5.0 | 1.5<br>1.5 | 6.5<br>5.5 | 11.0<br>9.0 | 1.5<br>1.0 | 12<br>9.5 | ns | 3–6 |
| $t_{PLH}$ | Propagation Delay $I_n$ to $Z_n$ | 3.3<br>5.0 | 1.5<br>1.5 | 5.0<br>4.0 | 8.5<br>6.5 | 1.0<br>1.0 | 9.0<br>7.0 | ns | 3–5 |
| $t_{PHL}$ | Propagation Delay $I_n$ to $Z_n$ | 3.3<br>5.0 | 1.5<br>1.5 | 5.0<br>4.0 | 8.0<br>6.5 | 1.0<br>1.0 | 9.0<br>7.0 | ns | 3–5 |

*Voltage Range 3.3 V is 3.3 V ±0.3 V.
*Voltage Range 5.0 V is 5.0 V ±0.5 V.

**DC CHARACTERISTICS**

| Symbol | Parameter | $V_{CC}$ (V) | 74ACT $T_A$ = +25°C | | 74ACT $T_A$ = –40°C to +85°C | Unit | Conditions |
|---|---|---|---|---|---|---|---|
| | | | Typ | Guaranteed Limits | | | |
| $V_{IH}$ | Minimum High Level Input Voltage | 4.5<br>5.5 | 1.5<br>1.5 | 2.0<br>2.0 | 2.0<br>2.0 | V | $V_{OUT}$ = 0.1 V or $V_{CC}$ – 0.1 V |
| $V_{IL}$ | Maximum Low Level Input Voltage | 4.5<br>5.5 | 1.5<br>1.5 | 0.8<br>0.8 | 0.8<br>0.8 | V | $V_{OUT}$ = 0.1 V or $V_{CC}$ – 0.1 V |
| $V_{OH}$ | Minimum High Level Output Voltage | 4.5<br>5.5 | 4.49<br>5.49 | 4.4<br>5.4 | 4.4<br>5.4 | V | $I_{OUT}$ = –50 μA |
| | | 4.5<br>5.5 | –<br>– | 3.86<br>4.86 | 3.76<br>4.76 | V | *$V_{IN}$ = $V_{IL}$ or $V_{IH}$<br>$I_{OH}$ –24 mA<br>–24 mA |
| $V_{OL}$ | Maximum Low Level Output Voltage | 4.5<br>5.5 | 0.001<br>0.001 | 0.1<br>0.1 | 0.1<br>0.1 | V | $I_{OUT}$ = 50 μA |
| | | 4.5<br>5.5 | –<br>– | 0.36<br>0.36 | 0.44<br>0.44 | V | *$V_{IN}$ = $V_{IL}$ or $V_{IH}$<br>$I_{OL}$ 24 mA<br>24 mA |
| $I_{IN}$ | Maximum Input Leakage Current | 5.5 | – | ±0.1 | ±1.0 | μA | $V_I$ = $V_{CC}$, GND |
| $\Delta I_{CCT}$ | Additional Max. $I_{CC}$/Input | 5.5 | 0.6 | – | 1.5 | mA | $V_I$ = $V_{CC}$ – 2.1 V |
| $I_{OLD}$ | †Minimum Dynamic Output Current | 5.5 | – | – | 75 | mA | $V_{OLD}$ = 1.65 V Max |
| $I_{OHD}$ | | 5.5 | – | – | –75 | mA | $V_{OHD}$ = 3.85 V Min |
| $I_{CC}$ | Maximum Quiescent Supply Current | 5.5 | – | 8.0 | 80 | μA | $V_{IN}$ = $V_{CC}$ or GND |

*All outputs loaded; thresholds on input associated with output under test.
†Maximum test duration 2.0 ms, one output loaded at a time.

**AC CHARACTERISTICS** (For Figures and Waveforms – See Section 3 of the ON Semiconductor FACT Data Book, DL138/D)

| Symbol | Parameter | $V_{CC}$* (V) | 74ACT $T_A$ = +25°C $C_L$ = 50 pF | | | 74ACT $T_A$ = –40°C to +85°C $C_L$ = 50 pF | | Unit | Fig. No. |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | | |
| $t_{PLH}$ | Propagation Delay S to $Z_n$ | 5.0 | 2.0 | – | 9.0 | 1.5 | 10.0 | ns | 3–6 |
| $t_{PHL}$ | Propagation Delay S to $Z_n$ | 5.0 | 2.0 | – | 9.5 | 2.0 | 10.5 | ns | 3–6 |
| $t_{PLH}$ | Propagation Delay $E_n$ to $Z_n$ | 5.0 | 1.5 | – | 10 | 1.5 | 11.5 | ns | 3–6 |
| $t_{PHL}$ | Propagation Delay $E_n$ to $Z_n$ | 5.0 | 1.5 | – | 8.5 | 1.0 | 9.0 | ns | 3–6 |
| $t_{PLH}$ | Propagation Delay $I_n$ to $Z_n$ | 5.0 | 1.5 | – | 7.0 | 1.0 | 8.5 | ns | 3–5 |
| $t_{PHL}$ | Propagation Delay $I_n$ to $Z_n$ | 5.0 | 1.5 | – | 7.5 | 1.0 | 8.5 | ns | 3–5 |

*Voltage Range 5.0 V is 5.0 V ±0.5 V.

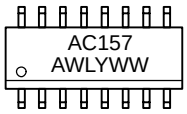
**CAPACITANCE**

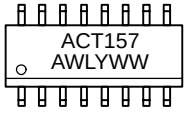
| Symbol | Parameter | Value Typ | Unit | Test Conditions |
|---|---|---|---|---|
| $C_{IN}$ | Input Capacitance | 4.5 | pF | $V_{CC}$ = 5.0 V |
| $C_{PD}$ | Power Dissipation Capacitance | 50 | pF | $V_{CC}$ = 5.0 V |

**MARKING DIAGRAMS**

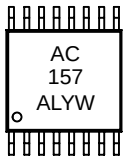
**DIP–16**

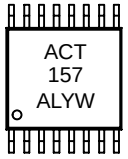
**SO–16**



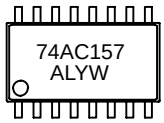



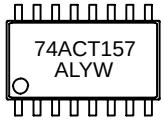

**TSSOP–16**




**EIAJ–16**

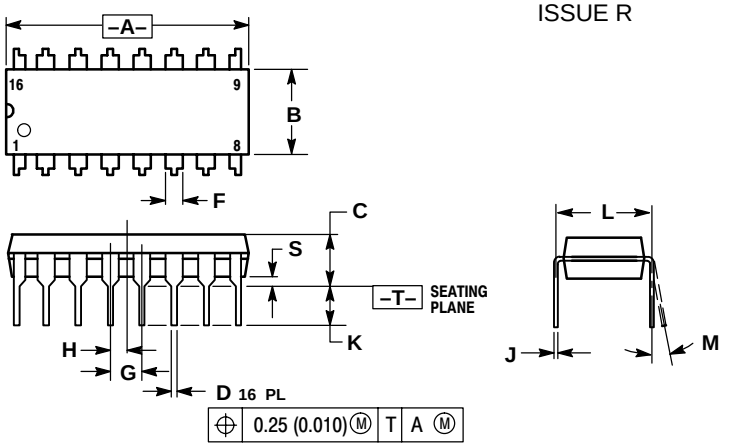



A = Assembly Location
WL, L = Wafer Lot
YY, Y = Year
WW, W = Work Week

## PACKAGE DIMENSIONS

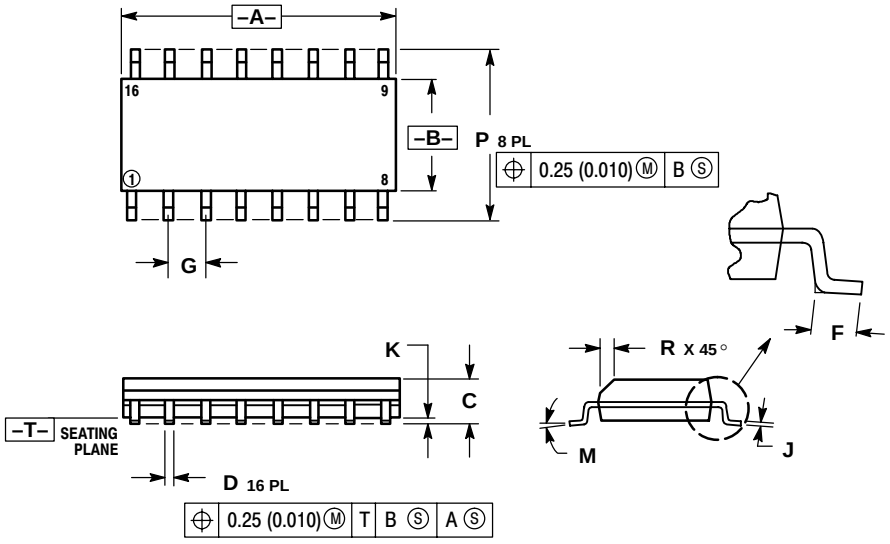
**PDIP–16**
**N SUFFIX**
16 PIN PLASTIC DIP PACKAGE
CASE 648–08
ISSUE R




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 0.740 | 0.770 | 18.80 | 19.55 |
| B | 0.250 | 0.270 | 6.35 | 6.85 |
| C | 0.145 | 0.175 | 3.69 | 4.44 |
| D | 0.015 | 0.021 | 0.39 | 0.53 |
| F | 0.040 | 0.70 | 1.02 | 1.77 |
| G | 0.100 BSC | | 2.54 BSC | |
| H | 0.050 BSC | | 1.27 BSC | |
| J | 0.008 | 0.015 | 0.21 | 0.38 |
| K | 0.110 | 0.130 | 2.80 | 3.30 |
| L | 0.295 | 0.305 | 7.50 | 7.74 |
| M | 0 ° | 10 ° | 0 ° | 10 ° |
| S | 0.020 | 0.040 | 0.51 | 1.01 |

**SO–16**
**D SUFFIX**
16 PIN PLASTIC SOIC PACKAGE
CASE 751B–05
ISSUE J

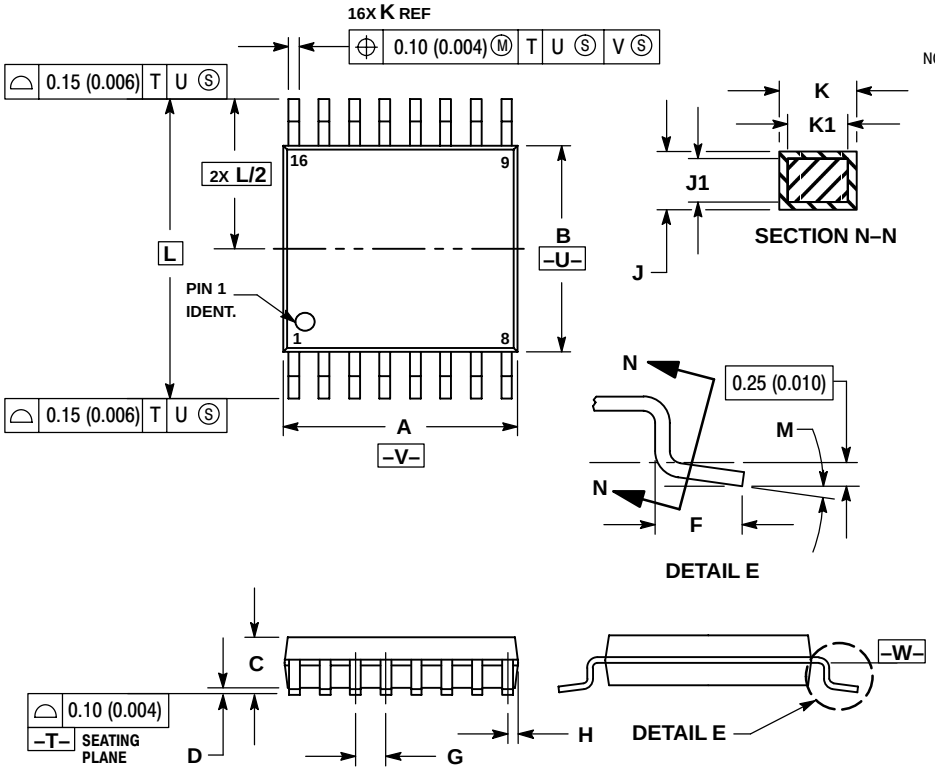



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

| | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 9.80 | 10.00 | 0.386 | 0.393 |
| B | 3.80 | 4.00 | 0.150 | 0.157 |
| C | 1.35 | 1.75 | 0.054 | 0.068 |
| D | 0.35 | 0.49 | 0.014 | 0.019 |
| F | 0.40 | 1.25 | 0.016 | 0.049 |
| G | 1.27 BSC | | 0.050 BSC | |
| J | 0.19 | 0.25 | 0.008 | 0.009 |
| K | 0.10 | 0.25 | 0.004 | 0.009 |
| M | 0 ° | 7 ° | 0 ° | 7 ° |
| P | 5.80 | 6.20 | 0.229 | 0.244 |
| R | 0.25 | 0.50 | 0.010 | 0.019 |

## PACKAGE DIMENSIONS

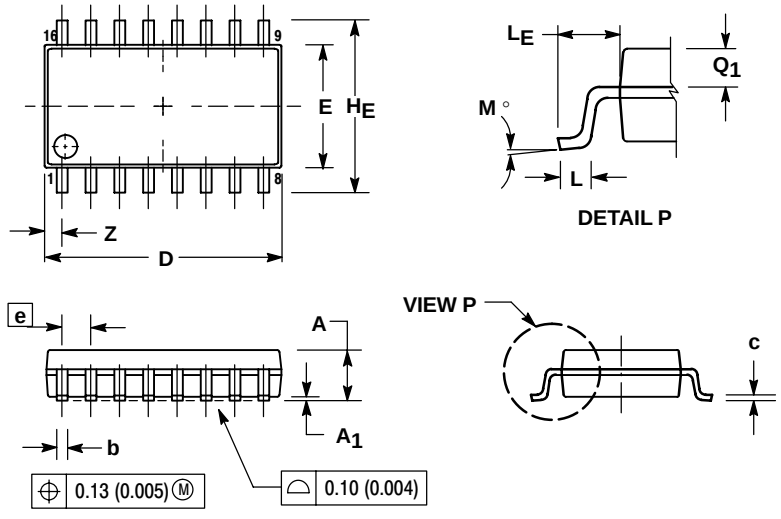
**TSSOP–16**
**DT SUFFIX**
16 PIN PLASTIC TSSOP PACKAGE
CASE948F–01
ISSUE O




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH. PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE –W–.

| | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 4.90 | 5.10 | 0.193 | 0.200 |
| B | 4.30 | 4.50 | 0.169 | 0.177 |
| C | --- | 1.20 | --- | 0.047 |
| D | 0.05 | 0.15 | 0.002 | 0.006 |
| F | 0.50 | 0.75 | 0.020 | 0.030 |
| G | 0.65 BSC | | 0.026 BSC | |
| H | 0.18 | 0.28 | 0.007 | 0.011 |
| J | 0.09 | 0.20 | 0.004 | 0.008 |
| J1 | 0.09 | 0.16 | 0.004 | 0.006 |
| K | 0.19 | 0.30 | 0.007 | 0.012 |
| K1 | 0.19 | 0.25 | 0.007 | 0.010 |
| L | 6.40 BSC | | 0.252 BSC | |
| M | 0 ° | 8 ° | 0 ° | 8 ° |

**EIAJ–16**
**M SUFFIX**
16 PIN PLASTIC EIAJ PACKAGE
CASE966–01
ISSUE O




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
5. THE LEAD WIDTH DIMENSION (b) DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.46 ( 0.018).

| | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | --- | 2.05 | --- | 0.081 |
| $A_1$ | 0.05 | 0.20 | 0.002 | 0.008 |
| b | 0.35 | 0.50 | 0.014 | 0.020 |
| c | 0.18 | 0.27 | 0.007 | 0.011 |
| D | 9.90 | 10.50 | 0.390 | 0.413 |
| E | 5.10 | 5.45 | 0.201 | 0.215 |
| e | 1.27 BSC | | 0.050 BSC | |
| $H_E$ | 7.40 | 8.20 | 0.291 | 0.323 |
| L | 0.50 | 0.85 | 0.020 | 0.033 |
| $L_E$ | 1.10 | 1.50 | 0.043 | 0.059 |
| M | 0 ° | 10 ° | 0 ° | 10 ° |
| $Q_1$ | 0.70 | 0.90 | 0.028 | 0.035 |
| Z | --- | 0.78 | --- | 0.031 |

# Notes

# Notes

# Notes

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